Mobile Learning

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INTRODUCTION

Mobile learning (variously shortened to M-Learning, M-learning, m-learning, mlearning, M Learning, or mLearning!) describes any form of education or training that is delivered using some kind of mobile device. As the power and sophistication of mobile devices increases, and wireless networks become faster and more ubiquitous, learning with a mobile device will become an integral part of the general spectrum of technology-supported learning. Furthermore, the special characteristics of mobile learning, including ubiquity, convenience, localization, and personalization, give it unique qualities that help it stand out from other forms of learning.

For some, mobile learning is simply an extension of electronic learning (e-learning), indeed it is sometimes referred to as mobile e-learning, and both can be seen, conceptually at least, as subsets of distance learning (Georgiev, Georgieva, & Smrikarov, 2004). However, such an approach fails to take into account either the restrictions of the mobile device, the special circumstances of the mobile learner, or the value-added aspects of mobility such as on-demand learning, ad-hoc networking, and location and context awareness.

Unlike desktop electronic learning environments, mobile learning can take place in changing contexts and via a range of mobile devices with many variations in form factor. Mobile learning systems must be adaptive both to the learner (in terms of his or her developing learning model and profile) and to the device (in terms of its functionality and its current environment). Therefore the hardware and software architectures for a mobile learning system provide a major technical challenge. Overcoming these difficulties can, however, enhance the learning experience, since mobile learning has the benefits of mobility and its supporting platform, which can be summarized as being ubiquity, convenience, localization, and personalization. Ubiquity means that the learning content can be accessed anywhere, regardless of location. With ever-increasing coverage by mobile network providers, mobile learning services can have an increasingly ubiquitous presence. This is particularly useful where mobile learning provides support for learners in the field, where information is urgently needed on site, perhaps to help diagnose medical conditions, analyze field data, or repair equipment. As mobile devices become more pervasive in our everyday lives, using these devices for learning becomes more convenient. High-speed 'always-on' data connections mean that the learner can access material when it is convenient to them, enabling learning to take place on an ad hoc basis.

Localization is a specific strength of mobile devices, since they can use location awareness to provide services that are targeted to the user's current locality. Location awareness has been used in a number of mobile learning solutions to enhance the user's experience, for example in the Ambient Wood project, where children explored a woodland environment using mobile technology (Rogers et al., 2004). Finally, personalization is a key component of mobile learning for two reasons. First, the difficulty of navigation and small screen size of mobile devices means that it is important to target learning material to the user as much as possible. Second, such targeting is easier for enrollment-based services like education, where the provider is likely to be able to gather considerable information about learners and construct accurate profiles of their activities and requirements.

In defining mobile learning we should also be aware that mobile learning does not necessarily mean wireless learning. A number of mobile learning solutions, typically those deployed on personal digital assistants (PDAs), enable the user to install a complete learning module that runs as a standalone application on the device. This type of approach is used in mobile applications that act as simple electronic training manuals, as well as tourist and museum guides, where the requirement for the software is short term and context driven, though location awareness may not be supported in non-wireless systems. While these types of mobile learning applications can be valuable, systems that include wireless connectivity can provide more interactivity, context awareness, and learner choice.

USING THE MOBILE ENVIRONMENT FOR LEARNING

As well as solving technical problems, developing a successful mobile learning solution depends on imaginative use of the mobile environment. There are examples in the literature of systems that leverage mobility to mimic film narrative, integrate mobile devices into multi-technology environments, encompass group game play, and store material in virtual spaces. In many cases these systems take advantage of location awareness and the ability of wireless devices to support communication between group members. Thus mobility enables individuals to participate in distributed simulations

and role plays across both space and time. Examples include the use of mobile devices to model the spread of disease and enable multi-role simulations. Learning scenarios with multiple branches can be used to indicate the usefulness of different outcomes, depending upon the decisions made by the learner, for example in medical diagnosis (Setaro, 2001). Lundin and Nulden (2003) describe multimedia scenarios used in a professional context based on the PIER approach, which has four main building blocks: problem-based learning, interactive multimedia, experiential learning, and role playing.

A number of examples of mobile learning are driven very much by the context of the learner, where the mobile device can be taken into an environment and be used as learning support in that environment. Examples of this type of system include those that provide location-aware information that is relevant to the context, those that allow the sharing of information about related contexts, and those that provide information about a context, regardless of actual location. *Location-aware* systems that provide information include tourist systems, and museum and archaeological systems. An interesting example is Urban Tapestries, which links urban stories to specific London locations (Walker, 2004). An early but interesting example of sharing information about related contexts is Wireless Coyote, where mobile learners working in different areas assisted each other's analyses of the environment (Grant, 1993). Sharples (2002) refers to this type of mobile learning system as conversational learning, stressing the value of interactivity between mobile learners. Systems that provide context-related information regardless of actual location include a mobile bird-watching learning system (Chen, Kao, Sheu, & Chiang, 2002) and ELDIT, a language translation system (Trifonova, Knapp, Ronchetti, & Gamper, 2004).

TYPES OF MOBILE LEARNING DELIVERY

Mobile learning can support many types of learners who will require different types of content and modes of delivery, and a mobile system may integrate with a wider academic or professional program or it may be stand alone. To support the flexibility of the learner, the content of a mobile curriculum needs to be broken down into short and focused nuggets of learning, the type of content that can be accessed in the 'downtime' of the learner, particularly in mobile learning systems that target the professional in the field. In situations where learning is used in a professional context, there is a concept of *just-in-time learning* (Koschembahr, 2005), where the mobile learning content has an on-the-job training focus. In this vein, workers in industries such as retail and fast food can get what might be called *fast learning* (McGee, 2003), focusing on low-level training modules and product information. A characteristic of this approach is the blurring of boundaries between acquiring information and learning. This encourages the view that, before long, an employee will not even be able to differentiate learning from other everyday job functions. However, we might question whether such a system is actually delivering learning, since the information being conveyed is often transient and trivial.

MOBILE LEARNING AS A DISRUPTIVE TECHNOLOGY

One of the key characteristics of a disruptive technology is that its adopters are prepared to accept a reduction in some qualities in order to benefit from innovation (Funk, 2004). There are some positive indications that mobile learning can be successful even in limited technical environments, suggesting that it has the characteristics of a disruptive technology. Research has shown that learners are prepared to accept technological limitations for the benefits of mobility. A study by Ericsson in 2002 showed that even with a simple Wireless Access Protocol (WAP) browser interface, users felt that mobile learning could be a quality experience (Ericsson, 2002a, 2002b). In the study, 77% of participants felt that mobility actually increased the quality of electronic learning, and all felt that one of its key benefits was its ability to increase access to education and training. Another study using the short message service (SMS) as an interactivity mechanism also suggested that the lack of sophistication of the platform need not be a major stumbling block to the quality of the learning experience. This study indicated that mobile learning applications can have depth and complexity, and encourage wider scale participation, even where it might be expected that technical limitations would discourage the learner (Stone, Briggs, & Smith, 2002). It seems therefore that technological sophistication is not necessarily a measure of usefulness, since even simple technologies like classroom response systems have proved effective, engendering rich social practice around basic systems (Roschelle, 2003).

CONCLUSION

In summary, mobile learning is a specialized field from both a technical and educational perspective, and one that will become increasingly important as wireless communication networks and mobile devices become more pervasive and sophisticated. In many ways, electronic and mobile learning will move closer together as the power and sophistication of mobile devices increase. However there will always be certain aspects of mobility, in particular ubiquity and location awareness, that will make mobile learning a unique and special approach to education.

REFERENCES

Chen, Y., Kao, T., Sheu, J., & Chiang, C. (2002). A mobile scaffolding-aid-based bird-watching learning system. *Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'02)* (p. 15), Växjö, Sweden.

Ericsson. (2002a). *Mobile learning in action: Report on the use of mobile telephones for training*. Retrieved January 24, 2006, from http://learning.ericsson.net/mlearning2/project_one/mobile_learning.html

Ericsson. (2002b). *Mobile learning in action: Report on the use of mobile telephones for training*. Retrieved January 2006 from http://learning.ericsson.net/mlearning2/project_one/mobile_learning.html

Funk, J. (2004). *Mobile disruption.* Hoboken, NJ: John Wiley & Sons.

Georgiev, T., Georgieva, E., & Smrikarov, A. (2004, June 17-18). M-learning—A new stage of e-learning. *Proceedings of the International Conference on Computer Systems and Technologies (CompSysTech'2004)*, Rousse, Bulgaria.

Grant, W. C. (1993). Wireless Coyote: A computer-supported field trip. *Communications of the ACM, 36*(5), 57-59.

Koschembahr, C. (2005). *Optimizing your sales workforce through mobile learning.* Retrieved September 2005 from http://www.learningcircuits.org/2005/apr2005/vonKoschembahr.htm

Lundin, J., & Nulden, U. (2003). Mobile scenarios: Supporting collaborative learning among mobile workers. In *Educating managers with tomorrow's technologies* (pp. 173-190). Greenwich, CT: Information Age Press.

McGee, M. K. (2003). *E-learning on the fly.* Retrieved September 2005 from http://www.informationweek.com/story/showArticle.jhtml?articleID=15800505

Rogers, Y., Price, S., Fitzpatrick, G., Fleck, R., Harris, E., Smith, H., et al. (2004, June 1-3). Ambient Wood: Designing new forms of digital augmentation for learning outdoors. *Proceedings of the 3rd International Conference for Interaction Design and Children (IDC 2004)*, College Park, MD.

Roschelle, J. (2003). Unlocking the learning value of wireless mobile devices. *Journal of Computer Assisted Learning,* 19, 260-272.

Setaro, J. L. (2001). *If you build it, will they come? Distance-learning through wireless devices.* Retrieved September 2005 from http://www.unisysworld.com/monthly/2001/07/wireless.shtml

Sharples, M. (2002). Disruptive devices: Mobile technology for conversational learning. *International Journal of Continuing Engineering Education and Lifelong Learning, 12*(5/6), 504-520.

Stone, A., Briggs, J., & Smith, C. (2002, August 29-30). SMS and interactivity—Some results from the field, and its implications on effective uses of mobile technologies in education. *Proceedings of the IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'02)* (p. 147), Växjö, Sweden.

Trifonova, A., Knapp, J., Ronchetti, M., & Gamper, J. (2004). Mobile ELDIT: Transition from an e-learning to an m-learning system. *Proceedings of the World Conference on Educational Multimedia, Hypermedia and Telecommunications.*

Walker, K. (2004, October 15). Learning on location with cinematic narratives. *Proceedings of the 1st Workshop on Story Representation, Mechanism and Context* (pp. 55-58), New York.

KEY TERMS

Conversational Learning: Using mobile devices as an aid to learning by interacting with other learners.

Localization: The delivery of services to the user that are aware of the user's current location and therefore tailored to that context.

Mobile Learning: Learning that takes place using some kind of mobile device.

Personalization: Providing content to the user that is based on his or her user profile.

Short Message Service (SMS): A service that allows short text messages to be passed between mobile phones via unused time on the control channel, using a store and forward mechanism.

Ubiquity: The availability of a service in most, if not all locations.

Wireless Access Protocol (WAP): A communications protocol developed specifically for mobile phones which supports page markup using the Wireless Markup Language (WML).